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Original scientific paper

THE MAIN QUALITY ATTRIBUTES OF NON-SPRAYED CHERRY LAUREL (*Laurocerasus officinalis* Roem.) GENOTYPES

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Cherry laurel (*Laurocerasus officinalis*) is naturally growing in black sea region in Turkey and the trees has not been spraying with pesticides. In natural growing conditions, all cherry laurel genotypes particularly fruits are seems resistant against pests. Astringent nature of fruits forms a barrier for pests. A total twelve cherry laurel accessions were harvested at full maturation time from various sites in Of district located in eastern black sea region in Turkey. Fruits were analyzed for their total phenolic (TP), total monomeric anthocyanin (TMA), total carotenoid (TC), Vitamin C and for their antioxidant capacity by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) in fruit flesh extract. Variability among accessions was greatest for total phenol (TP) and total anthocyanins content ranged from 154 to 213 mg GAE per 100 g and 397 to 519 mg per 100 g. The results indicated that cherry laurel fruits are superior and unique in terms of bioactive content in particular compared to bioactive rich fruit species.

Key words: Cherry laurel, Genetic Resources, Total phenolics, Genotype, Total anthocyanin

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INTRODUCTION

A wide range of pests and diseases, which at worst can reduce the crop, and damage or even kill the tree, attacks the fruit trees (NÉMETH *et al*., 2001; MAUSSE and BANDEIRA, 2007). It's true that some species and cultivars leaving nature to itself without of pests and disease damages, survive without being pesticide but they give consistent quality (ERCISLI, 2004).

On the other hand, recently there is much concern over the dangers of chemical products such as pesticides and fertilizers that applied fruit trees to avoid pests and also to increase crop yield. They may be misused because the instructions are not written in the language spoken by the person using the product. There have been many reports of people suffering from severe skin rashes and headaches as a result of using chemical pesticides (LOCK *et al*., 2001; TITLIĆ *et al*., 2008). There are an estimated one million cases of poisoning by pesticides each year around the world. Up to 20.000 of this result in death. Most of the deaths occur in developing countries where chemical pesticides, which are banned in Europe or the USA, are still available (WORLD HEALTH ORGANIZATION, 2012).

Horticultural crops, which have been bred by modern breeding methods, tend to be very similar and if one plant is susceptible to a disease, all the other plants are as well (BANIER, 2011). Although some new modern varieties may be very resistant to specific pests and diseases they are often less suited to the local climate and soil conditions than traditional varieties. It can therefore be dangerous to rely too much on any one of them.

Therefore a wide variety or "genetic diversity" between the plants within a single crop is important (MILETIĆ and PAUNOVIĆ, 2012; MRATINIĆ *et al*., 2012; ODALOVIĆ *et al*., 2013)

This helps the crop to resist pests and diseases and acts as an insurance against crop failure in unusual weather such as drought or flood. Also, the right choice of crop will help to deter pests and disease (ERCISLI, 2004)

Eastern black sea region of Turkey is one of the most picturesque regions of Turkey having variety of traditional fruit species including such as medlar, raspberry, persimmon, chestnut, tea, cherry laurel etc. that naturally resistant to high humidity of the region. Most of these fruit species has numerous unnamed genotypes that naturally growing in the region and they do not sprayed with pesticides (AKBULUT *et al*., 2007). It is also diverse in ecological habitats ranging from mountains to valley with rich diversity in plants and crops. Local communities of the region practice their traditional cultivation practices of diverse crop suitable in different ecosystems solely on natural harsh land conditions with limited external inputs to the system; and value the land and the environment for the sustainability of the system for future generations.

Among fruit species grown in the region, some of them for example cherry laurel is one of the most important fruits grown in region and it is free of pest and diseases and therefore they are not sprayed properly or are left untreated with pesticides. They a have been grown and selected over many centuries to meet the requirements of the farmer in the region and almost each small garden has at least one cherry laurel tree (BEYHAN, 2010).

It is very popular fruit among local people and abundantly distributed in the Black Sea Region (ALASALVAR *et al*., 2005) in Turkey. The fruits of the specie have been selling in market as fresh or dried with high price. They have high contents of potentially health-promoting components (ALASALVAR *et al*., 2005; ORHAN and AKKOL, 2011). Cherry laurel fruits and seeds have been used as traditional medicines for a long time in Turkey, as well (BAYTOP, 2004). It is also connected to the heritage of cultural values in the region and makes a cultural bridge

between local peoples and their relatives who migrated to the western parts of the country. When the local peoples harvest the cherry laurel fruits they can prepare it as fresh or processes into several special products and send them to relatives living away from region as special gift.

More recently, strong competition and consumers' expectations in the food sector forced food producers to create new products with high sensory attractiveness and health-promoting properties. They often use less-known fruits because of their health-promoting characteristics due to the high contents of vitamins and antioxidants (MRATINIĆ and FOTIRIĆ, 2007). Cherry laurel is more recently gained more and more importance due to increase of demand to natural grown, non-sprayed fruits that suitable for organic production as well.

In this study, we aimed to determine the characteristic composition that related to both human health and pest resistance as well. We used a number of non-sprayed cherry laurel genotypes naturally growing in the Eastern Black Sea Region in Turkey.

MATERIALS AND METHODS

The study was conducted in Of region in Eastern Black Sea Region in Turkey. A total of twelve natively grown (non-sprayed with pesticides) cherry laurel (*Laurocerasus officinalis*) genotypes were used. The chemical analyses encompassed 50 randomly chosen mature fruits per genotype. The determined human health and pest resistant parameters (bioactive contents) included total anthocyanin, total phenol, total carotenoid, vitamin C, and antioxidant activity.

For extraction, fruit homogenates obtained with a blender were extracted with acetone, water, and acetic acid (70:29.5:0.5, v/v/v) for 1 h in darkness (SERCE *et al*., 2010). This extract was filtered and used for phytochemical (bioactive content) analysis.

Total anthocyanin content was measured with the pH differential absorbance method as described by SERCE *et al*. (2010). Briefly, absorbance of the extract was measured at 510 and 700 nm in buffers at pH 1.0 (hydrochloric acid–potassium chloride, 0.2 M) and 4.5 (acetate acid–sodium acetate, 1 M). Anthocyanin content was calculated using a molar extinction coefficient of 26,900 (cyanidin-3-glucoside) and absorbance of $A = [(A_{510} - A_{700})_{pH\ 1.0} - (A_{510} - A_{700})_{pH\ 4.5}]$. Results were expressed as mg cyaniding 3-glucoside equivalents per 100 g fresh weight.

Total phenolics in the *extracts* were determined colorimetrically using Folin-Ciocalteu reagent as described by SERCE *et al*., (2010). Gallic acid was used as a standard and results were expressed as mg gallic acid equivalents per 100 g fresh weight.

Antioxidant activity was determined spectrophotometrically, according to SERCE *et al*. (2010), as the percent of DPPH (2,2-diphenyl-1-picrylhydrazyl) activity inhibition in fruit flesh extract. The results were expressed as µmol Trolox equivalent per g fresh weight.

Total carotenoids were *extracted* according to the method of TALCOTT and HOWARD (1999), and measured at 470 nm wavelength using spectrophotometer, and calculated. The results were expressed mg per 100 g fresh weight.

Vitamin C was determined with the reflectometer set of Merck Co (Merck RQflex).

We also compared our results with phytochemical or bioactive rich fruit species as well.

The experiment was a completely randomized design with five replications. Data were subjected to analysis of variance and means were separated by Duncan multiple range test at $P<0.01$ significant level (SAS, 2005).

RESULTS AND DISCUSSION

In the present study, we found considerable variations in all chemical characteristics among cherry laurel genotypes at p<0.01 level (Table 1).

Table 1. Fruit bioactive characteristics of eleven selected cherry laurel (Laurocerasus officinalis L.) genotypes

Genotypes	Total anthocyanin (mg/100 g)	Total phenolic content (mgGAE/100g FW)	Total carotenoid content (mg/100 g FW)	Vitamin C (mg/100 g)	DPPH (µmol Trolox/ g FW)
OF1	165cd	397c	268ab	3.74^{NS}	23.8b
OF2	179c	406c	227ab	2.96	25.7ab
OF3	202ab	441bc	255ab	6.12	34.2ab
OF4	154d	399c	206ab	4.67	24.6b
OF5	197b	458b	244ab	4.88	34.3ab
OF6	213a	487ab	269a	7.11	35.9a
OF7	188bc	476ab	240ab	5.45	33.9ab
OF8	211ab	519a	219b	6.98	34.8ab
OF9	186bc	493ab	266ab	4.49	34.3ab
OF10	191bc	469b	262ab	5.15	31.2ab
OF11	177c	480ab	240ab	4.11	28.36ab
OF12	197a	496b	260b	5.7ab	30.3ab

*Values in the same column with different lower-case letters are significantly different at *P*<0.01.

The total anthocyanins contents of twelve cherry laurel genotypes ranged from 154 mg to mg expressed as cyanidin-3-glucoside equivalents per 100 g fresh weight basis (Table 1). The genotype seemed to influence the extent of total anhocyanin accumulation in fruits. Total anthocyanin contents of cherry laurel fruits previously were reported between 123 and 206 mg (ALASALVAR *et al*., 2005; HALILOVA and ERCISLI, 2010). As indicated in Table 2, cherry laurel fruits one of the richest fruit in terms of anthocyanin compared to anthocyanin rich fruit species and also cherry group fruits including sweet and sour cherries.

Anthocyanin pigments are responsible for the red-purple to blue colors of many fruits, vegetables, and grains. They are water-soluble and have been used as natural food colourants for a long time, and therefore are regarded as safe substances (POTTER *et al*., 1997; BORDIGNON-LUIZ *et al*., 2007). Anthocyanins are not only nontoxic and nonmutagenic, but they have positive therapeutic properties such as antioxidant, anti-inflammatory, anticarcinogenic, antiviral, and antibacterial effects (TALL *et al*., 2004).

In this experiment, the total carotenoid contents were greatly different among the cherry laurel genotypes and varied from 206 to 269 mg per 100 g fresh weight (Table 1). Results obtained for cherry laurel genotypes indicate that cherry laurel fruits are also a good source of

carotenoids, not only anthocyanin. ALASALVAR *et al*. (2005) reported total caretonoid content between 250-261 mg among two cherry laurel genotypes in Turkey. Our data are in agreement with the reported carotenoid contents. Carotenoids are the most widely distributed group of pigments naturally accumulating in large quantities, and are known for their structural diversity and various functions including the brilliant red, orange, and yellow colors of edible fruits (SOCACIU, 2008). Carotenoids are known to have antioxidant activity by quenching free radicals and singlet oxygen. The ability of carotenoids to function as antioxidants may contribute to the reduction in disease risk (TONUCCI *et al*., 1995).

The total phenolic contents of cherry laurel genotypes were in the range of 397 mg to 519 mg GAE per 100 g fresh fruit (Table 1). When compared to phenolic rich fruits, it is clear that cherry laurel fruits are superior in terms of total phenolic content (Table 2). Earlier, a wide variation was observed on total phenolic content in fruits of two cherry laurel genotypes that ranged from 454 to 651 mg ferulic acid equivalents/100 g fresh weight (ALASALVAR *et al*., 2005). The phenolic content and composition of fruits and vegetables depend on the genetic and environmental factors as well as post-harvest processing conditions (LANDMARK and ALM, 2006). Plant phenolics are the largest class of plant secondary metabolites, which, in many cases, serve in plant defense mechanisms to counteract the reactive oxygen species (ROS) in order to survive and prevent molecular damage and damage by microorganisms, insects, and herbivores (PRIOR *et al*., 1998).

Table 2. The fruit bioactive content of cherry laurel (Laurocerasus officinalis L.) genotypes and bioactive rich fruit species (KIM *et al*., 2005; VURSAVUS *et al*., 2006; RIMPARA *et al*., 2007; KOCA and KARADENIZ, 2009; SERRANO *et al*., 2009; BOBINAITE *et al*., 2012; MIKULIC-PETKOVSEK *et al*., 2012; BALLISTRERI *et al*., 2012; CONTESSA *et al*., 2013)

Species	Total anthocyanin (mg/100 g)	Total phenolic content (mgGAE/100g FW)
Blueberry	18-222	77-320
Blackberry	95-158	133-610
Raspberry	2-130	107-503
Strawberry	23-79	86-398
Black currant	110-224	95-493
Black mulberry	106-341	175-342
Sour cherry	45-109	109-295
Sweet cherry	6-150	23-168
Cherry laurel	154-213	397-519

The antioxidant activity was highly different among cherry laurel genotypes (23.8 to 35.9 µmol Trolox/ g fresh weight, Table 1). This parameter is very important from nutritive point of view because cherry laurel fruits are edible when ripe and it is clear that they are a valuable source of some biologically active compounds, including antioxidants.

CONCLUSION

The past decade witnessed an increasing demand on less-known crops for various reasons, such as greater food security, healthy nutrition, cultural knowledge, income etc. From this study, it s clear that cherry laurel is an important example of great plant diversity in Turkey. Currently various non-governmental organizations and governmental projects are under way to declare local species and reintroduce them to farmers and consumers for a sustainable utilization and on-farm conservation in Turkey. This rich genetic potential becomes important to plant breeding programs. Especially, these land races can be utilized to obtain commercial varieties.

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OSNOVNI ATRIBUTI KVALITETA NEPRSKANIH GENOTIPOVA TREŠNJE LAUREL (*Laurocerasus officinalis* Roem.)

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Izvod

Trešnja laurel (*Laurocerasus officinalis*) uspeva u prirodnim uslovima crnomorskog regiona i nije prskana pesticidima i svi genotipovi u prirodnim uslovima su otporni na pesticide, naročito plodovi. Plodovi ukupno dvanaest genotipova u različitim regionima u istočnom crnomorskom region Turske. su analizirani u punoj zrelosti ploda. Vršene su analize ukupnih fenola (TP), ukupnih monomeernih antocijana (TMA), ukupnih karotenoida (TC) i vitamina C i njihov ukupni antioksidantski kapacitet C korišćenjem 2,2-diphenyl-1-picrylhydrazyl (DPPH) u ekstraktu svežih plodova. Utrđena je najveća varijabilnost u ukupnim fenolima (TP) u rasponu od 154 – 213 mg GAE u 100 g, i ukupnih antocijana, u rasponu od 397 – 519 mg GAE na 100 g. Rezultati ukazuju da su plodovi trešnje laurel superiorni i jedinstveni u sadržaju bioaktivnih materija, posebno kada se uporede sa plodovima vrsta čiji plodovi su bogati bioaktivnim supstancama.

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